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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,329	03/09/2004	Thomas Watkins Lloyd JR.	RD-29334	4288

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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EXAMINER	
TABATABAI, ABOLFAZL	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,329	LLOYD ET AL.	
	Examiner	Art Unit	
	Abolfazl Tabatabai	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-4, 6-8, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harding et al (U. S. 6,678,057 B2) in view of Crampton (U. S. 2003/0231793 A1).

Regarding claim 1, Harding discloses a non-contact measurement system for providing gauge measurements of an object, comprising:

at least one light source to illuminate said object with structured light (column 4, lines 6-12);

an imaging device to obtain at least one image of said illuminated object (fig.1, element 20 and column 3, lines 9-17);

an image register configured to store information corresponding to a reference model of said object and at least one image of said object (column 4, lines 50-54);

a gauge measurement module configured to receive said registered image of said object and to identify gauge measurements from said registered image of said object (column 2, lines 1-8).

However, Harding is silent about the specific details regarding the step of:

a transformation estimator coupled to said image register and adapted to register said at least one image of said object to said object reference model.

In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprising the step of:

a transformation estimator coupled to said image register and adapted to register said at least one image of said object to said object reference model [page 8, paragraph (0113)].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a transformation estimator as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Regarding claim 2, Harding is silent about the specific details regarding the non-

contact measurement system of claim 1 wherein said image register is configured to store one or more sets of patches associated with said object reference model and one or more sets of patches associated with said at least one image of said object.
In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprises image register is configured to store one or more sets of patches associated with said object reference model and one or more sets of patches associated with said at least one image of said object [pages 8-10, paragraph (0136)].
It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use store one or more sets of patches as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Regarding claim 3, Harding is silent about the specific details regarding the non-contact measurement system of claim 2 wherein said transformation estimator is configured to compare patches associated with said object reference model with corresponding patches associated with said at least one image of said object to register said at least one image of said object with said object reference model.
In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprises transformation estimator is configured to compare patches associated with said object reference model with corresponding patches associated with said at least one image of said object to register said at least one image of said object

with said object reference model [pages 9-10, paragraph (0136)].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use compare patches as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Regarding claim 4, Harding discloses the non-contact measurement system of claim 1 further comprising a filter module coupled to said image register for filtering (column 3, lines 42-50) a registered scanned image (column 3, lines 23-27) and removing noise (column 5, lines 2-6).

Regarding claim 6, Harding is silent about the specific details regarding the method of claim 5, for providing non-contact gauge measurements of an object wherein the step of registering said image with said reference model data includes performing, at least once, the steps of:

(a) comparing a plurality of patches of said reference model data with a plurality of associated patches of said image to identify pose data for said image; and,

(b) adjusting the pose of said image response to said identified pose data.

In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprising the steps of:

(a) comparing a plurality of patches of said reference model data with a plurality of associated patches of said image to identify pose data for said image [paragraph (0136)]; and,

(b) adjusting the pose of said image response to said identified pose data [paragraphs (0023) and (0148)].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use comparing a plurality of patches and adjusting the pose of said image as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Regarding claim 7, Harding discloses a non-contact measurement system for providing gauge measurements of an object, comprising:

at least one light source adapted to illuminate said object (column 4, lines 6-12);

at least one imaging device for obtaining a scanned image of said illuminated object (fig.1, element 20, and column 3, lines 9-17);

a memory configured to store data representative of a reference model of said object and data representative of at least one scanned image of said object obtained by said at least one imaging device; at least one software module configured to manipulate said scanned image to increase a signal-to-noise ratio (column 4, lines 50-54).

However, Harding is silent about the specific details regarding the steps of:

at least one software module configured to register said scanned image with said reference model data;

at least one software module configured to manipulate said scanned image to increase a signal-to-noise ratio;

at least one software module configured to process said scanned image to facilitate identification of edges of said object; and,

at least one software module configured to extract gauge measurements from said scanned image.

In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprising the steps of:

at least one software module [page 3, paragraph (0024)] configured to manipulate said scanned image to increase a signal-to-noise ratio [page 5, paragraph (0090)];

at least one software module [page 3, paragraph (0024)] configured to register said scanned image with said reference model data [page 5, paragraph (0090)];

at least one software module [page 3, paragraph (0024)] configured to process said scanned image to facilitate identification of edges of said object [page 16, paragraph (0267)]; and,

at least one software module [page 3, paragraph (0024)] configured to extract gauge measurements from said scanned image [page 13, paragraph (0177)].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use configured to manipulate said scanned image to increase a

signal-to-noise ratio, one software module configured to process said scanned image to facilitate identification of edges of said object, one software module configured to extract gauge measurements from said scanned image and one software module configured to extract gauge measurements from said scanned image as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Claim 8, is similarly analyzed as claim 6 above.

Regarding claim 11, Harding is silent about the specific details regarding the non-contact measurement system of claim 7 for providing gauge measurement of an object wherein said at least one light source is positioned to provide backlight illumination on said object; and, said imaging device is further configured to obtain at least one image of said object illuminated by said backlight illumination at a first object orientation; and, said at least one software module configured to register said scanned image with said reference model data is further configured to incorporate said at least one backlight illuminated image into registration processing.

In the same field of endeavor, however, Crampton discloses scanning apparatus and method comprising the steps of:

at least one light source is positioned to provide backlight illumination on said object [page 6, paragraph (0095)]; imaging device is further configured to obtain at least one image of said object illuminated by said backlight illumination at a first object

orientation [page 8, paragraph (0123)]; at least one software module [page 3, paragraph (0024)] configured to register said scanned image with said reference model data is further configured to incorporate said at least one backlight illuminated image into registration processing [paragraphs (0023), (0095) and (0181)].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use first object orientation and to incorporate said at least one backlight illuminated image into registration processing as taught by Crampton in the system of Harding because Crampton provides Harding an improved system which is most efficient in the quest to reduce the time and cost of generating a computer model from a real-world object by means of scanning with both time and cost reductions of an order of magnitude achieved over conventional techniques.

Claim 12 is similarly analyzed as claim 11 above.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 5 is rejected under 35 U.S.C. 102(e) as being anticipated by Harding et al (U. S. 6,678,057 B2).

Regarding claim 5, Harding discloses a method of providing non-contact gauge measurements of an object comprising the steps of:

projecting structured light using at least one light source on said object to illuminate said object (column 3, lines 42-47 and 53-57);

obtaining at least one image of said illuminated object (column 2, lines 28-31 and 53-63);

providing data representative of a known reference model of said object (column 2, lines 61-67);

registering said image with said reference model data (column 41, lines 51-54); and,

identifying gauge measurements of said object from said registered image of said object (column 2, lines 1-8).

5. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harding et al (U. S. 6,678,057 B2) and Crampton (U. S. 2003/0231793 A1) as applied to claim 8 above, and further in view of Vlahos et al (U. S. 6,538,396 B1).

Regarding claim 9, Harding and Crampton are silent about the specific details regarding the non-contact measurement system of claim 8 for providing gauge measurement of an object wherein said at least one software module configured to manipulate said scanned image to increase a signal-to-noise ratio is further configured to generate a composite image from each of said two or more images acquired at different illumination levels.

In the same field of endeavor, however, Vlahos discloses automatic foreground lighting effects a composited scene comprises one software module configured to manipulate said scanned image to increase a signal-to-noise ratio is further configured to generate a composite image from each of said two or more images acquired at different illumination levels (column 1, lines 42-46).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a composite image from each of said two or more images acquired at different illumination levels as taught by Vlahos in the system of Harding because Vlahos provides Harding an improved system which automatically alters the system illumination level of the subject by varying the red, green and blue levels in a composite image.

Regarding claim 10, Harding discloses the non-contact measurement system of claim 9, wherein said composite image comprises pixels representative of scaled values of light intensity within a predetermined light intensity range (column 1, lines 15-21 and column 3, lines 53-63).

6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harding et al (U. S. 6,678,057 B2) and Crampton (U. S. 2003/0231793 A1) as applied to claim 7 above, and further in view of Tu et al (U. S. 6,876,459 B2).

Regarding claim 13, Harding and Crampton are silent about the specific details regarding the non-contact measurement system of claim 7, for providing gauge measurement of an object wherein said at least one light source is positioned and configured to produce a linear highlight along an edge of said object; and wherein said

at least one software module configured to process said scanned image to facilitate identification of edges of said object further configured to identify said linear highlight in said scanned image.

In the same field of endeavor, however, Tu discloses method and apparatus for optical measurement of the leading edge position of airfoil automatic foreground lighting comprises one software module configured to process said scanned image to facilitate identification of edges of said object further configured to identify said linear highlight in said scanned image (column 1, lines 22-26).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a composite image from each of said two or more images acquired at different illumination levels as taught by Tu in the system of Harding because Tu provides Harding an improved system which is related to light gauging measurements and an apparatus for locating the leading edge of an object or the like, so the system provides accurate leading edge location information.

Other Prior Art Cited

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Dimsdale (U. S. 6,246,468 B1) discloses integrated system for quickly and accurately imaging and modeling 3D objects.

Makino et al (U. S. 5,627,771) disclose apparatus and method for evaluating shape of 3D object.

Besl et al (U. S. 5,715,166) disclose apparatus for the registration of 3D shapes.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to ABOLFAZL TABATABAI whose telephone number is (571) 272-7458.

The Examiner can normally be reached on Monday through Friday from 9:30 a.m. to 7:30 p.m. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Bhavesh Mehta, can be reached at (571) 272-7453. The fax phone number for organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Abolfazl Tabatabai

Patent Examiner

Technology Division 2624

April 22, 2007

A-Tabatabai